11/90

90-380178/51 J03 K05 X14 KUBO/ 16.04.89
KUBOTA H *J0 2275-397-A
16.04.89-JP-096178 *(09.11.90)* G21b-01

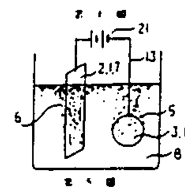
Nuclear fusion device - by immersing anode and cathode of heavy enriched metal in heavy water, applying high tension voltage

C90-165652

J(3-A) K(5-A3)

An anode and a cathode of a heavy hydrogen-enriched metal e.g. Pd, Ti, or Zr are immersed in a heavy water, and a high tension voltage of 30-200,000 V is applied to the electrodes to cause a nuclear fusion reaction. The cathode is partly or wholly of spherical, columnar, bar-like, or block form. The tip of the bar-like cathode may have a semi-spherical form.

USE/ADVANTAGE - Causes nuclear fusion reaction and at the same time generates electricity using catalytic, condensing, and compressing effects of the hydrogen/(heavy hydrogen) occlusive alloy in the simplified small size appt. (6pp Dwg.No.1/12)



includes translation

⑲日本国特許庁(JP)　　⑪特許出願公開

⑫公開特許公報(A)　　平2-275397

⑤Int. Cl.⁵	識別記号	庁内整理番号	㊸公開　平成2年(1990)11月9日
G 21 B 1/00	Z	7458-2G	

審査請求　未請求　請求項の数　6　（全6頁）

⑭発明の名称　核融合装置

㉑特　願　平1-96178
㉒出　願　平1(1989)4月16日

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明細書

1　発明の名称

核融合装置

2　特許請求の範囲

1　電極(1)の陽極(2)と重水素吸蔵金属である陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置において、陰極(3)の電極(1)の全部又は一部を球形、又は円柱、又は棒状、又は環、又は棒の先端が半球としたことを特徴とした核融合装置。

2　電極(1)の陽極(2)と重水素吸蔵金属である陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置において、陰極(3)の電極(1)として水素吸蔵合金(11)を使用したことを特徴とした核融合装置。

3　電極(1)の陽極(2)と重水素吸蔵金属である陰極(3)を重水(8)に浸して核融合を起こす装置において、電極(1)に30V～200万Vの高電圧電流を流し、又は帯電、又は印加したことを特徴とした核融合装置。

4　ホンダ・フジシマ効果を利用した光化学反応装置において陰極(3)を重水素吸蔵金属として使用し、又、水の代わりに重水(8)を使用したことを特徴とした核融合装置。

5．水素吸蔵合金(11)又はパラジウム(9)又はチタン(10)などの重水素吸蔵金属に重水素(5)を吸収させ、外部から加熱、冷却、加圧装置(19)で水素吸蔵合金(11)、又はパラジウム(9)又はチタン(10)、又はジルコニウム中の重水素(5)を加熱及び冷却及び加圧するよう装置を配置したことを特徴とした核融合装置。

6　特許請求の範囲請求項5において重水素(5)を吸収させた水素吸蔵合金(11)又はパラジウム又はチタン(10)又はジルコニウムなどの重水素吸蔵金属に電流を流し、又は帯電させ、又は印加したことを特徴とした核融合装置。

3　発明の詳細な説明

(イ)産業上の利用分野

この発明は、核融合装置に関する。

(ロ)従来の技術

太陽などの恒星は、その膨大な質量の水素ガスが重力による超高温、超高圧の下で圧縮され核融合を起こし続けているが、人類が人工的に核融合に成功しているケースは水爆として実現しているのみで継続的な制御には至ってはいない。現在はこの核融合実現のため臨界実験を目指す実験装置でさえ一基数千億円もかかる装置を建造しているが、臨界の目途さえたっていないのが現状である。しかし、最近、水の電気分解のような簡単な装置で核融合が起きうる可能性が報告されているが決定的な評価には至っていない。この装置は陰極に使用している金属のパラジウムが６００倍の体積の水素を吸収し原子のすき間に保持する性質があることを利用し、このパラジウムを陰極とし、陽極として金又は白金を配置し、この両電極間に電気を流して重水を電気分解するもので、陰極に重水素が、陽極に酸素が発生し、陰極に発生した重水素は直ちに金属パラジウムの重水素吸収能力と電圧による圧縮効果によって凝縮、圧縮され、重水素の圧縮率は実に１０^{27}気圧にも相当する。これにより水素同士の距離が非常に小さくなり、重水素同士が至近距離で飛び交う内にぶつかりあい融合してトリチウム、ヘリウム４、ヘリウム３に変化し、その際に膨大な熱エネルギーを放出する。

(ハ)発明が解決しようとする課題

今までに報告されている低温核融合の実験結果は約２．５秒に１回の割りでしか核融合が発生せず、又、１０兆分の１ワットという微弱なエネルギーしか取り出すことが出来ないということである。これはパラジウムの原子間に取り込まれた重水素の凝縮率がまだ低いため重水素が飛び回っても重水素同士がぶつかる確率が低く充分に核融合が進行しないことによると見られる。更に、今までの陰極に使用している電極は主に板状であったので、凝縮、圧縮には不向きであった。

(ニ)課題を解決するための手段

1　電極(1)の陽極(2)と陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置において、陰極(3)の電極(1)の全部又は一部を球形、又は円柱、又は棒状、又は塊、又は棒の先端を半球とする。具体的には電線(13)と電極(1)を固着するが、球形電極を導電性支持具(14)で支え、この支持具(14)に電線(13)をつなぐ方法もある。

2　電極(1)の陽極(2)と陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置において、陰極(3)の電極(1)として水素吸蔵合金(11)を使用する。

3　電極(1)の陽極(2)と陰極(3)を重水(8)に浸して核融合を起こす装置において、電極(1)に30V～200万Vの高電圧電流を流し、又は帯電、又は印加する。

4　ホンダ・フジシマ効果を利用した光化学反応装置において陰極(3)を重水素凝縮金属として使用し、又、水の代わりに重水(8)を使用する。この場合、使用する陰極(3)としてはチタン(10)の表面を焼いて酸化チタン(16)としたものを用いる。

5　水素吸蔵合金(11)、又はパラジウム(9)、又はチタン(10)などの重水素凝縮金属に重水素(5)を吸収させ、外部から加熱、冷却、加圧装置(19)で水素吸蔵合金(11)、又はパラジウム(9)、又はチタン(10)などの重水素凝縮金属中の重水素(5)を加熱及び冷却及び加圧するよう装置を配置する。

6　特許請求の範囲請求項５の装置の重水素凝縮金属に電流を流し、帯電させ、又は印加する。つまり、重水素(5)を吸収させた重水素凝縮金属を、加熱、冷却、加圧装置(19)で重水素凝縮金属中の重水素(5)を加熱及び冷却、加圧しながら重水素凝縮金属に電流を流し、又は帯電させ、又は印加させる。

(ホ)作用

1　パラジウム(9)などの金属は水素などの気体を大量に吸収するが、吸収するに従い中央部が最も凝縮率、圧縮率が大きくなる。従って、パラジウム(9)、又はチタン(10)又は水素吸蔵合金(11)などで出来た陰極(3)にこの球形の電極(1)を用いると、球形の表面から重水(8)の電気分解によって発生した大量の

重水素(5)を吸収し、この電極(1)の中心部は最も重水素(5)の濃縮、圧縮率が高くなる。これにより、電極(1)中心部では核融合が起きる。同様に球形よりも効率が落ちるが、円柱、又は棒状、又は錐、又は棒の先端が半球であるものも板状の電極よりははるかに効率的である。

2　水素吸蔵合金(11)は種類が非常に多彩でパラジウム(9)よりも水素、重水素(5)の吸収率、濃縮率が大きなものが数多く存在する。又、水素吸蔵合金(11)は成分がニッケル、バナジウム、マンガン、チタン、などを使用しているので触媒効果もあり吸収された重水素(5)が活性化される。そこで電極(1)の陽極(2)と陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置の陰極(3)側の電極(1)として水素吸蔵合金(11)を使用すると、従来のパラジウム(9)を陰極(3)に使用した場合に比べ、より重水素(5)を吸収し、濃縮するので水素吸蔵合金中の重水素(5)同士の距離は接近し、ぶつかりあう確率が高くなり、はるかに核融合を起こしやすくなる。又、重水素(5)を吸収した水素吸蔵合金(11)は取り扱いが簡単で高圧ボンベなどを必要としないので重水素(5)を吸収したまま運搬、入れ換えが簡単に出来るというメリットがある。更に、重水素(5)が核融合によってヘリウム4、ヘリウム3、トリチウムに変化しても重水素(5)を保持しているのと同様に原子間にトリチウム、ヘリウム3、ヘリウム4を保持するので、みだりに放射線源を外部に放出しないというメリットもある。又、水素吸蔵合金(11)は加熱、冷却することにより吸収した重水素(5)を放出したり吸収したりするので、融合反応そのものも制御できる。

3　電極(1)の陽極(2)と陰極(3)を重水(8)に浸して核融合を起こす装置において、電極(1)に30V～200万Vの高電圧電流を流し、又は帯電、又は印加することにより、陰極(3)の中央部に濃縮された重水素(5)同志を融合させる、いわゆる触媒の働きをする。これは本来ならば重水素(5)同志はプラスの電荷を持つので同じ重水素(5)同志では反発しあい、融合までは至らないが、電圧、電流の働きにより陰極(3)内部は電子が豊富となりそれが重水素(5)同志の反発をやや中和させる結果となり重水素(5)同志が融合しやすくなる。

4　光化学反応装置にホンダ・フジシマ効果という装置があるが、これは水の中に陽極(2)として白金(7)を、陰極(3)に酸化チタン(16)などを配置し、陰極(3)と陽極(2)を電線(13)で短絡し又は負荷(22)をかけて、酸化チタン(16)の陰極(3)に光(23)を充てると両電極(1)間に電気が発生すると同時に陰極(3)に水素、陽極(2)に酸素(6)が発生する。そこで金属チタン(10)の表面のみ焼いて酸化チタン(16)としたものを陰極(3)として用い、水の代わりに重水(8)を入れて装置を作動させると、陰極(3)側に発生した重水素(5)はただちに酸化チタン(16)の内部のチタンに吸収、濃縮され、さらに発生した電気によってチタン内の重水素(5)は圧縮され核融合を起こすこととなる。この装置の利点は太陽の下で核融合が可能となるのでどんなへき地でも稼働できる点にある。

5　前述のように水素吸蔵合金(11)は種類が非常に多彩で重水素(5)の吸収率、濃縮率が大きなものが数多く存在する。又、水素吸蔵合金(11)は触媒効果もあり吸収された重水素(5)が活性化される。従って水素吸蔵合金(11)に重水素(5)を吸収させ、外部から加熱冷却装置(19)で水素吸蔵合金(11)中の重水素(5)を加熱又は冷却すると、水素吸蔵合金(11)は高温では重水素(5)を放出し、低温では重水素(5)を吸収する性質があるので、重水素(5)の濃縮率を制御することが出来るためこれにより核融合を制御出来る。更に効率を高めるため、重水素加圧装置も設置するとより能率的に反応し、制御も出来る。この場合の条件はあくまでも水素吸蔵合金(11)の重水素(5)吸収率

が飛躍的に高いものを選んだ場合である。この場合、外部の触媒等の助けは必要とせず充分に核融合の制御を行うことが出来る。

6　重水素(5)を吸収させた重水素吸蔵金属を、加熱、冷却、加圧装置(19)で重水素吸蔵金属中の重水素(5)を加熱及び冷却、加圧しながら重水素吸蔵金属に電流を流すと、重水素同士はプラスであるので、なかなか融合しずらいが電流を通し、又は帯電させ、又は印加することにより、電子が大量に重水素吸蔵金属の中に入り込み、これが中和剤の役目をし、重水素原子同士がぶつかりやすくなり、核融合が起きる。

(ヘ)実施例

1　特許請求の範囲請求項1実施例

前述の陰極(3)が球形である外、陰極(3)の電極(1)の全部又は一部を球形、又は円柱、又は棒状、又は錐、又は棒の先端が半球であるものなどがある。

2　特許請求の範囲請求項2実施例

前述のように、水素吸蔵合金電極(1)の陽極(2)と重水素吸蔵金属である陰極(3)を重水(8)に浸し、両電極(1)に電気を流して核融合を起こす装置において、陰極(3)の電極(1)として水素吸蔵合金(11)を使用する。

3　特許請求の範囲請求項3実施例

電極(1)の陽極(2)と重水素吸蔵金属である陰極(3)を重水(8)に浸して核融合を起こす装置において、電極(1)に30V～200万Vの高電圧電流を流し、又は帯電、又は印加

4　特許請求の範囲請求項4実施例

ホンダ・フジシマ効果を利用した光化学反応装置において陰極(3)を重水素吸蔵金属として、又、水の代わりに重水(8)を使用

5　特許請求の範囲請求項5実施例

重水素吸蔵金属である水素吸蔵合金(11)又はパラジウム(9)又はチタン(10)に重水素(5)を吸収させ、外部から加熱冷却装置(19)で水素吸蔵合金(11)、又はパラジウム(9)、又はチタン(10) 中の重水素(5)を加熱及び冷却するよう装置を配置する。

なお、重水素吸蔵金属の性能が十分に高いものであれば加圧装置なしでもよい。

(ト)発明の効果

従来の核融合装置に比べ次のような効果がある。

1　特許請求の範囲請求項1

(1)陰極電極が球形であるので従来の板状電極に比べ効率的に重水素の吸蔵、圧縮が出来るので核融合が起きやすい。同様に円柱、棒状、錐、半球でも球形電極よりは劣るにしても、板状電極よりは、はるかに吸蔵圧縮が出来る。

(2)外形が球形であると核融合による熱が全方向に放出されるので、陰極の周囲の重水が熱交換器の役割を果たし効率的に熱エネルギーの回収が出来る。

(3)陰極の電極支持具を使用した場合は、陰極の取り替えが、より簡単に出来る。

2　特許請求の範囲請求項2

(1)水素吸蔵合金は種類が非常に多彩でパラジウムよりも重水素の吸収率、吸蔵率が大きなものが数多く存在するので用途に合ったものを使用すると効果的である。

(2)水素吸蔵合金は触媒効果もあるので吸収された重水素が活性化されるため効率的である。

(3)水素吸蔵合金は取り扱いが簡単で高圧ボンベなどを必要としないので重水素を吸収したまま運搬、入れ換えが簡単に出来るというメリットがある。

(4)みだりに放射線量を外部に放出しない。

(5)水素吸蔵合金は加熱、冷却することにより吸収した重水素を放出したり吸収したりするので、融合反応そのものも制御できる。

3　特許請求の範囲請求項3

(1)装置が簡単である。

(2)電流、電圧の制御をすれば核融合の制御にもなるので操作が簡単である。

(3)構造が簡単。

4　特許請求の範囲請求項4

(1)光を当てるだけで核融合が進行するので、

どんな所でも核融合が実現出来る。

(2)核融合と同時に電気も発生するので一石二鳥である。

5　特許請求の範囲請求項5

(1)水素吸蔵合金の触媒効果と凝縮、圧縮効果により核融合を行うので、装置が非常に簡単で幾らでも小型の核融合装置を製作出来る。

(2)外部からの加熱、冷却、加圧により核融合を制御するので装置が簡単で故障が起きにくい。

(3)加熱、冷却、加圧装置の電源さえあれば、どこででも核融合を起こすことが出来る。

(4)水素吸蔵合金は、重水素を充分に吸収させたうえで運搬し、交換が出来るので施設の無い所でもその機能を充分に果たすことが出来る。

6　特許請求の範囲請求項6

(1)装置が非常に簡単で幾らでも小型の核融合装置を製作出来る。

(2)外部からの加熱、冷却、加圧、電流電圧により核融合を制御するので装置が簡単で故障が起きにくい。

(チ)図面の簡単な説明

第1図は、本発明の特許請求の範囲請求項1の一実施例の概略図で陰極(3)を球形としたもの。

第2図～第4図は、本発明の特許請求の範囲請求項1の一実施例の概略図でそれぞれ陰極(3)が円柱、棒状の先端に半球としたもの、環であるもの。

第5図～第6図は、本発明の特許請求の範囲請求項2の一実施例の概略図で陰極を水素吸蔵合金としたもの。

第7図は、本発明の特許請求の範囲請求項3の一実施例の概略図で本核融合装置に高電圧を印加したもの。

第8図は、本発明の特許請求の範囲請求項1の一実施例の概略図で陰極(3)を電極支持具(14)で支えたところを示す図。

第9図は、本発明の特許請求の範囲請求項4の一実施例の概略図でホング・フジシマ効果を利用した核融合装置で陰極(3)を重水素凝縮金属として使用し、水の代わりに重水(8)を使用したことを示す図。

第10図は、本発明の特許請求の範囲請求項5の一実施例の概略図で重水素凝縮金属である水素吸蔵合金(11)、パラジウム(9)、チタン(10)に重水素(5)を吸収させておき、加熱冷却装置で各融合を制御する図。

第11図は、本発明の特許請求の範囲請求項5の一実施例の概略図で、第10図の装置に加圧装置を加えたもの。

第12図は、本発明の特許請求の範囲請求項6の一実施例の概略図で、第11図の装置の重水素凝縮金属に電流を流す装置を加えたもの。

1・・電極　　2・・陽極

3・・陰極　　4・・金属板

5・・重水素　　6・・酸素

7・・白金　　8・・重水

9・・パラジウム　　10・・チタン

11・・水素吸蔵合金　　12・・アース

13・・電線　　14・・電極支持具

15・・受光窓　　16・・酸化チタン

17・・重水素を吸収した水素吸蔵合金、チタン、パラジウム、ジルコニウムなどの重水素凝縮金属

18・・保温容器兼重水素容器兼圧力容器

19・・加熱、冷却、加圧装置

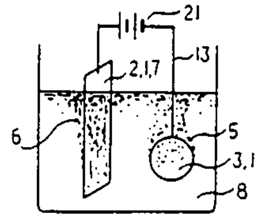
20・・熱交換器、熱電対など

21・・電源　　22・・負荷

23・・光

特許出願人　久保田　博

第1図



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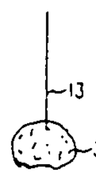

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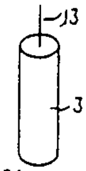

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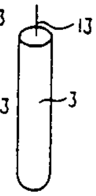
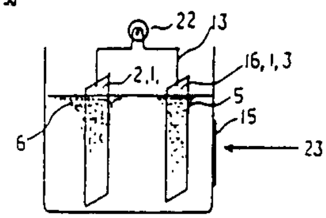
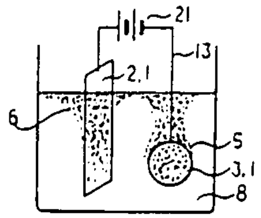


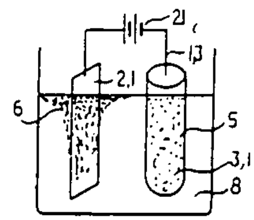
第9図



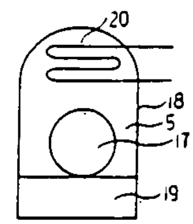
第5図



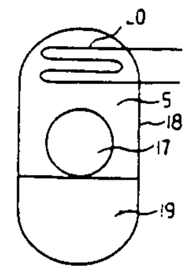
第6図



第10図



第11図



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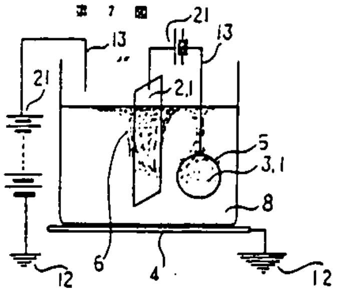
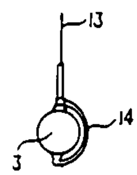
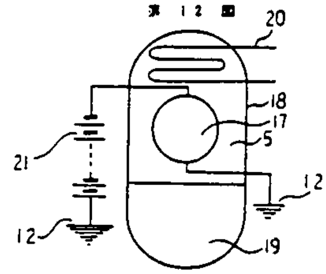


第8図



第12図



PTO 94-314

Japanese Kokai Patent Application
No. Hei 2[1990]-275397

can heat or cool electrode
pressurize system
apply light to electrode
(see element 23)

NUCLEAR FUSION DEVICE

Hiroshi Kubota

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. NOVEMBER, 1993
TRANSLATED BY THE RALPH MCELROY TRANSLATION CO.

Code: PTO 94-314

JAPANESE PATENT OFFICE
PATENT JOURNAL
KOKAI PATENT APPLICATION NO. HEI 2 [1990]-275397

Int. Cl.	G 21 B 1/00
Sequence Nos. for Office Use:	7458-2G
Application No.:	Hei 1[1989]-96178
Application Date:	April 16, 1989
Publication Date:	November 9, 1990
No. of Inventions:	6 (Total of 6 pages)
Examination Request:	Not requested

NUCLEAR FUSION DEVICE

[Kakuyugo sochi]

Inventors:	Hiroshi Kubota
Applicant:	Hiroshi Kubota

[There are no amendments to this patent.]

Claims

1. A type of nuclear fusion device characterized by the following facts: electrodes (1), including an anode (2) and a cathode (3) made of deuterium-concentrating metal, are immersed

in heavy water (8); a current flows between two electrodes (1) to induce the nuclear fusion; in this device, the entire or a portion of cathode (3) among electrodes (1) is formed in spherical shape, cylindrical shape, rod shape, block shape, or semi-spherical shape on the tip of a rod.

2. A type of nuclear fusion device characterized by the following facts: electrodes (1), including an anode (2) and a cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8); a current flows between two electrodes (1) to induce the nuclear fusion; in this device, cathode (3) among electrodes (1) is made of hydrogen-absorptive metal (11).

3. A type of nuclear fusion device characterized by the following facts: electrodes (1), including anode (2) and cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8) for nuclear fusion; a current at a high voltage of 30 V - 2 million V flows between, or charged, or applied to electrodes (1) [sic].

4. A type of nuclear fusion device characterized by the fact that cathode (3) made of a deuterium-concentrating metal is used in a photochemical reaction device using the Honda-Fujishima effect, and heavy water (8) is used in place of water.

5. A type of nuclear fusion device characterized by the following facts: deuterium (5) is absorbed in a deuterium-concentrating metal, such as hydrogen-absorptive metal (11), palladium (9), titanium (10), etc.; deuterium (5) in hydrogen-absorptive metal (11), palladium (9), titanium (10), or zirconium is heated, or cooled and pressurized by means of a unit (19) for heating/cooling and pressurizing from the exterior.

6. The nuclear fusion device described in Claim 5 characterized by the fact that the deuterium-concentrating metal which absorbs deuterium (5), such as hydrogen-absorptive metal (11), palladium, titanium (10), or zirconium, has a current flowing in it, or is charged or is applied [with a voltage].

Detailed explanation of the invention

Application field in industry

This invention concerns a type of nuclear fusion device.

Prior art

The sun and other stars continuously perform nuclear fusion as the huge mass of hydrogen in them is compressed by gravity to a superhigh temperature and superhigh pressure. On the other hand, humans have succeeded in performing nuclear fusion only in the form of the hydrogen bomb, yet there is still no way to realize controlled nuclear fusion. At present, scientists are trying to build experimental equipment targeting on the critical experiment for realizing nuclear fusion. While the equipment costs several hundred billion Japanese yen, the target of the critical line has not been reached yet. However, recently, it was reported that simple equipment can be used to realize nuclear fusion by means of the electrolysis of water. However, the decisive evaluation on the result has not yet been settled. In the equipment reported, palladium used as the cathode has the ability to absorb 600 times in volume of hydrogen with respect to

the metallic palladium. With palladium used as the cathode and gold or platinum used as the anode, the two electrodes are set with a current flowing through them to induce electrolysis of heavy water. Consequently, deuterium is formed on the cathode while oxygen is generated on the anode. The deuterium generated at the cathode is immediately compressed to a dense state by the deuterium absorptivity of metallic palladium and the compressing effect of the voltage. The compression rate of deuterium can reach a level equivalent to 1027 atm. As a result, the distance among the hydrogen [sic, deuterium] nuclei becomes very small. At this short distance, deuterium nuclei collide with each other, leading to nuclear fusion, forming tritium, helium-4 and helium-3, accompanied with the release of a huge amount of thermal energy.

Problems to be solved by the invention

According to the experimental results of the low-temperature nuclear fusion reported up to now, the nuclear fusion takes place only once in about 2.5 sec, and the power output level is as low as 10-13 [one in 10 trillion] W. This is because the concentration rate of deuterium trapped between palladium atoms is low; hence, the probability of collision between deuterium nuclei as they fly back and forth is low, and nuclear fusion cannot be performed at a high probability. Furthermore, as the electrode now used as cathode is usually in plate shape, concentration/compression cannot be performed sufficiently.

Means for solving the problems

1. Electrodes (1), including an anode (2) and a cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8); a current flows between two electrodes (1) to induce the nuclear fusion; in this device, the entire or a portion of cathode (3) among electrodes (1) is formed in spherical shape, cylindrical shape, rod shape, block shape, or semi-spherical shape on the tip of a rod. More specifically, the following configuration may be adopted: wire (13) and electrode (1) are fixed; and a spherical electrode is supported by an electroconductive fixture (14); this fixture (14) is connected to wire (13).

2. Electrodes (1), including an anode (2) and a cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8); a current flows between two electrodes (1) to induce the nuclear fusion; in this device, cathode (3) among electrodes (1) is made of hydrogen-absorptive metal (11).

3. Electrodes (1), including anode (2) and cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8) for nuclear fusion; a current at a high voltage of 30 V - 2 million V flows between, or charged, or applied on electrodes (1) [sic].

4. Cathode (3) made of a deuterium-concentrating metal is used in a photochemical reaction device using the Honda-Fujishima effect, and heavy water (8) is used in place of water. In this case, as for cathode (3) used, the surface of titanium (10) is quenched and used as titanium oxide.

5. Deuterium (5) is absorbed in a deuterium-concentrating metal, such as hydrogen-absorptive metal (11), palladium (9), titanium (10), etc.; deuterium (5) in hydrogen-absorptive metal (11), palladium (9), titanium (10), or zirconium is heated, or cooled and pressurized by means of a unit (19) for heating/cooling and pressurizing from the exterior.

6. In the equipment described in Item 5, the deuterium-concentrating metal has a current flowing in it, or it is charged or is applied [with a voltage]. That is, while in the deuterium-concentrating metal with deuterium (5) absorbed in it, deuterium (5) is heated/cooled and pressurized by heating/cooling and pressurizing unit (19), a current flows in the deuterium-concentrating metal, or it is charged, or [a voltage] is applied on it.

Functions

1. Palladium (9) or other metal can absorb a large amount of hydrogen or other gas. For the central portion of the [electrode providing] absorption, the concentration rate and the compression rate are the highest. Consequently, when cathode (3) made of palladium (9), titanium (10), or hydrogen-absorptive metal (11) is used as this spherical-shaped electrode (1), a large amount of deuterium (5) generated due to electrolysis of heavy water (8) is absorbed on the spherical-shaped surface of this electrode. At the central portion of this electrode (1), the concentration and the compression rate of deuterium (5) are the highest. In this way, nuclear fusion can take place at the central portion of electrode (1). Also, other shapes, such as

cylindrical shape, block shape, rod with tip formed in semi-spherical shape, etc. can be adopted, although the efficiency is not so high as that of the spherical shape. In addition, a plate-shaped electrode may also be adopted.

2. There are many types of hydrogen-absorptive alloys (11), many of them have higher absorptivity and concentration rate for hydrogen and deuterium (5) than those of palladium (9). The components of hydrogen-absorptive metal (11) include nickel, vanadium, manganese, titanium, etc. They also have a catalyst effect, and can activate absorbed deuterium (5). In a nuclear fusion device, which has anode (2) and cathode (3) of electrodes (1) immersed in heavy water (8) and has a current flowing between two electrodes (1) to make nuclear fusion, when hydrogen-absorptive metal (11) is used as electrode (1) on the side of cathode (3) [sic' is used as cathode (3)], compared with the conventional configuration with palladium (9) used as cathode (3), more deuterium (5) can be absorbed and concentrated. Consequently, the distance between deuterium (5) in the hydrogen-absorptive metal is reduced, the collision probability is increased, and the nuclear fusion can take place much more easily. Also, hydrogen-absorptive metal (11) with deuterium (5) absorbed in it can be handled easily, and there is no need to use a high-pressure gas bottle, etc. when deuterium (5) is transported in the absorbed state, and exchange can also be made easily. This is also an advantage. In addition, even when deuterium (5) is changed to helium-4, helium-3, and tritium by means of the nuclear fusion, tritium, helium-3, and helium-4 can still be kept in the same way as deuterium (5). Consequently, no radioactive substance leaks to the exterior. This is another

advantage. When hydrogen-absorptive metal (11) is heated/cooled, deuterium (5) absorbed in it can be released/absorbed; hence, the nuclear fusion itself can be adjusted.

3. In the nuclear fusion device, in which anode (2) and cathode (3) of electrodes (1) are immersed in heavy water (8) for nuclear fusion, a current at a high voltage of 30 V - 2 million V flows between electrodes (1), or the electrodes are charged or applied with [the voltage]. In this way, deuterium (5) concentrated at the central portion of cathode (3) performs the nuclear fusion, that is, there is an action of a catalyst [by the current]. Originally, as nuclei of deuterium (5) have the same sign of charge, nuclei of deuterium (5) repel each other and nuclear fusion cannot take place. Now, due to the action of the current and voltage, a large amount of electrons appear inside cathode (3), and they neutralize the repelling effect among nuclei of deuterium (5), so that nuclear fusion among deuterium (5) becomes easier.

4. In the device making use of the Honda-Fujishima effect, an anode (2) made of platinum (7) and a cathode (3) made of titanium oxide (16) are set in water. With cathode (3) and anode (2) short-circuited by wire (13) or connected via a load (22), as light (23) is irradiated on cathode (3) made of titanium oxide (16), electricity is generated between two electrodes (1). At the same time, hydrogen is generated at cathode (3), while oxygen (6) is generated at anode (2). When only the surface of metallic titanium (10) is baked to form titanium oxide (16), which is used as cathode (3), and heavy water (8) is used in place of water to operate the system, deuterium (5) generated on the side of cathode (3) is immediately absorbed and concentrated in titanium

within titanium oxide (16). By means of the electricity generated, deuterium (5) in titanium is compressed to induce nuclear fusion. The advantage of this device is that nuclear fusion can be performed under sunshine. Consequently, nuclear fusion can be performed anywhere.

5. As pointed out in the above, there are many types of hydrogen-absorptive metal (11), with many having high absorptivity and concentration rate for deuterium (5). Also, hydrogen-absorptive metal (11) also has the catalyst effect in activating absorbed deuterium (5). Consequently, when deuterium (5) is absorbed in hydrogen-absorptive metal (11), and deuterium (5) in hydrogen-absorptive metal (11) is then heated/cooled by means of an external heating/cooling unit (19). hydrogen-absorptive metal (11) can release deuterium (5) at the high temperature and it can absorb deuterium (5) at a low temperature. Consequently, the concentration rate of deuterium (5) can be controlled in performing the nuclear fusion. In order to further increase the efficiency, a deuterium-pressurizing unit may be set to perform the reaction effectively under control. In this case, the conditions should be selected to ensure that the absorptivity of deuterium (5) by hydrogen-absorptive metal (11) can be significantly increased. In this case, there is no need to use external catalyst, yet the nuclear fusion can be controlled well.

6. For deuterium-concentrating metal with deuterium (5) absorbed in it, as deuterium (5) in the deuterium-concentrating metal is heated/cooled and pressurized by means of a heating/cooling and pressurizing unit (19), while a current flows through it, or it is charged or with [a voltage] applied on it, a large amount of electrons enter it and neutralize the charge of

deuterium nuclei, which otherwise repel each other due to the same plus sign of charge and make it impossible to perform the nuclear fusion, so that it becomes easier for the deuterium atoms [sic, nuclei] to collide with each other for the nuclear fusion.

Application examples

1. Application Example corresponding to Claim 1

In addition to the spherical shape of cathode (3), cathode (3) of electrodes (1) may be entirely or partially formed to have cylindrical shape, rod shape, block shape, or semi-spherical shape on the tip portion.

2. Application Example corresponding Claim 2

Electrodes (1), including an anode (2) and a cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8); a current flows between two electrodes (1) to induce the nuclear fusion; in this device, cathode (3) among electrodes (1) is made of hydrogen-absorptive metal (11).

3. Application Example corresponding Claim 3

Electrodes (1), including anode (2) and cathode (3) made of deuterium-concentrating metal, are immersed in heavy water (8) for nuclear fusion; a current at a high voltage of 30 V - 2 million V flows between, or charged, or applied on electrodes (1) [sic].

4. Application Example corresponding to Claim 4

Cathode (3) made of a deuterium-concentrating metal is used in a photochemical reaction device using the Honda-Fujishima effect, and heavy water (8) is used in place of water.

5. Application Example corresponding to Claim 5

Deuterium (5) is absorbed in a deuterium-concentrating metal, such as hydrogen-absorptive metal (11), palladium (9), titanium (10), etc.; deuterium (5) in hydrogen-absorptive metal (11), palladium (9), titanium (10), or zirconium is heated, or cooled and pressurized by means of a unit (19) for heating/cooling and pressurizing from the exterior.

Also, if the performance of the deuterium-concentrating metal is high enough, there may be no need to use the pressurizing unit.

Effects of the invention

Compared with the conventional type of nuclear fusion device, this invention has the following effects.

1. Effects corresponding to Claim 1

(1) As the cathode electrode has a spherical shape, compared with the conventional plate electrode, concentration and compression of the deuterium can be performed more easily. Also, for the cylindrical shape, rod shape, and semi-spherical shape, although the effects are worse than that of the spherical shape electrode, the degree of concentration/compression is still much better than that of the conventional plate-shaped electrode.

(2) As the shape is spherical, heat generated by the nuclear fusion is released in all directions. Consequently, the heavy water at the periphery of the cathode can play the role of a heat exchanger, and the thermal energy can be recovered with a high efficiency.

(3) When a fixture for cathode is used, exchange of the cathode can be performed easily.

2. Effects corresponding to Claim 2

(1) There are many types of hydrogen-absorptive alloys, with many having absorptivity and concentration rate of deuterium even higher than those of palladium. Consequently, they can be selected to fit the specific application well.

(2) As the hydrogen-absorptive alloy also has the catalyst effect, the absorbed deuterium can be activated, and the efficiency can thus be increased.

(3) The handling of the hydrogen-absorptive alloy can be performed easily, without using a high-pressure bottle. Consequently, the hydrogen-absorptive alloy with deuterium absorbed in it can be transported and exchanged easily.

(4) No radioactive substance can leak to the exterior.

(5) By heating/cooling the hydrogen-absorptive alloy, the absorbed deuterium can be released/absorbed, and the nuclear fusion can be controlled.

3. Effects corresponding to Claim 3

(1) The equipment is simple.

(2) With current and voltage under control, the nuclear fusion can also be controlled in a simple operation.

(3) The structure is simple.

4. Effects corresponding to Claim 4

(1) As the nuclear fusion can be performed by simply irradiating light, the nuclear fusion can be performed anywhere.

(2) As electricity is also generated at the same time of the nuclear fusion, one hits two birds with a single stone.

5. Effects corresponding to Claim 5

(1) As nuclear fusion is performed by means of the catalyst effect of the hydrogen-absorptive alloy and the compression effect, the equipment is very simple, and the size is compact for nuclear fusion.

(2) As nuclear fusion can be controlled by heating/cooling and pressurizing from the exterior, the equipment is simple and trouble-free.

(3) Nuclear fusion can be performed anywhere as long as there is a power source for the heating/cooling and pressurizing equipment.

(4) With deuterium fully absorbed, the hydrogen-absorptive alloy can be transported and exchanged. Consequently, the function can be well displayed even at a site where there is no facility.

6. Effects corresponding to Claim 6

(1) The equipment is very simple and the size is very small for the nuclear fusion device.

(2) As nuclear fusion can be controlled by heating/cooling and pressurizing from the exterior, the equipment is simple and trouble-free.

Brief explanation of the figures

Figure 1 is a schematic diagram illustrating an application example corresponding to Claim 1 with a spherical-shaped cathode (3).

Figures 2-4 are schematic diagrams illustrating an application example corresponding to Claim 1 of this invention,

with cathode (3) having cylindrical shape, semi-spherical shape for the rod tip, and block shape, respectively [sic; possibly, block and semi-spherical shape, respectively].

Figures 5-6 are schematic diagrams illustrating an application example corresponding to Claim 2, with cathode made of a hydrogen-absorptive alloy.

Figure 7 is a schematic diagram illustrating an application example corresponding to Claim 3, with a high voltage applied on this nuclear fusion device.

Figure 8 is a schematic diagram illustrating an application example corresponding to Claim 4 of this invention, with cathode (3) supported by an electrode fixture (14).

Figure 9 is a schematic diagram illustrating an application example corresponding to Claim 4, with deuterium-concentrating metal used as cathode (3) for the nuclear fusion device using the Honda-Fujishima effect, and with water used in place of heavy water (8).

Figure 10 is a schematic diagram illustrating an application example corresponding to Claim 5, with hydrogen-absorptive alloy (11), palladium (9), or titanium (10) used as deuterium-concentrating metal for absorbing deuterium (5), and with the nuclear fusion controlled by means of a heating/cooling unit.

Figure 11 is a schematic diagram illustrating an application example corresponding to Claim 5, with a pressurizing unit annexed to the equipment shown in Figure 10.

Figure 12 is a schematic diagram illustrating an application example corresponding to Claim 6, with a current-flow unit for the deuterium-concentrating metal added to the equipment shown in Figure 11.

1, electrode
2, anode
3, cathode
4, metal plate
5, deuterium
6, oxygen
7, platinum
8, heavy water
9, palladium
10, titanium
11, hydrogen-absorptive alloy
12, ground
13, wire
14, electrode fixture
15, light-receiving window
16, titanium oxide
17, deuterium-concentrating metal, such as hydrogen-absorptive alloy, titanium, palladium, zirconium, etc.
18, thermal insulating vessel, also as deuterium container and pressure container
19, heating/cooling and pressurizing unit
20, heat exchanger, thermocouple, etc.
21, power source
22, load
23, light

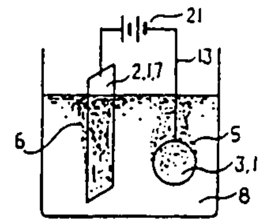


Figure 1

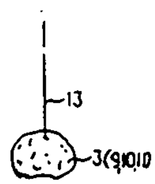


Figure 2

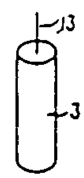


Figure 3

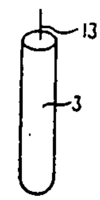


Figure 4

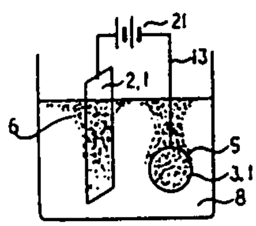


Figure 5

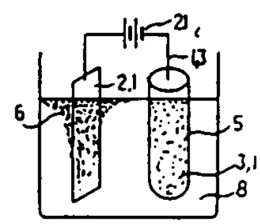


Figure 6

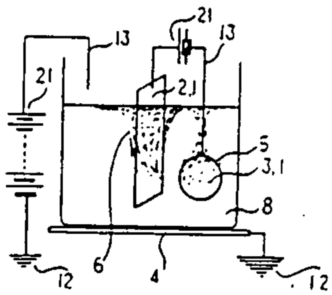


Figure 7

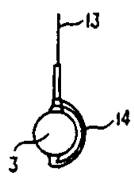


Figure 8

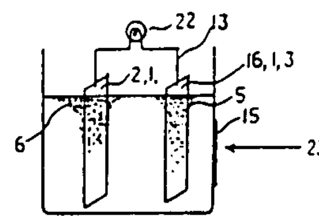


Figure 9

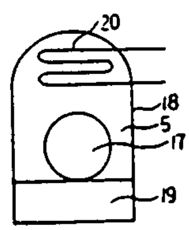


Figure 10

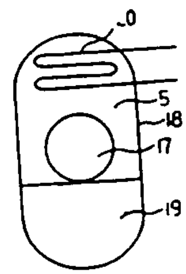


Figure 11

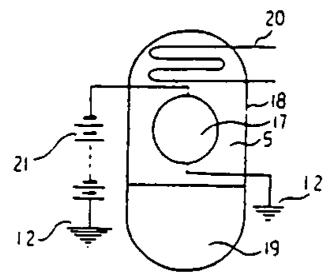


Figure 12